

Technical Memorandum

Downtown/Riverfront Streetcar Studies

City of West Sacramento

Conceptual Civil and Track Engineering

February 26, 2007

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CONCEPTUAL CIVIL AND TRACK ENGINEERING

1.0 Description of Task

This technical memorandum presents the currently proposed alignments (Option A and Option B). This level of design enables an initial analysis and discussion of how the alignment and streetcar interact with surrounding environments including existing traffic, parking, adjacent properties and pedestrian and bicycle. Also discussed are potential cost-saving design elements that can be realized through alignment design.

2.0 Alignment Descriptions

The alignment options presented in this memorandum were chosen earlier in the Phase 1 process as being most consistent with project objectives. The following descriptions further refine the chosen routes by specifying a lane which the alignment could occupy, as well as a potential trackway type, i.e. in-street or exclusive running.

A few of the factors which help determine the “best lane” and type of trackway include width of existing roadway and right of way, existing traffic operations, physical restrictions such as overhead clearances, existing parking, and existing and proposed pedestrian and bicycle facilities. One of the most significant factors, particularly in terms of project costs, is the location of existing underground and overhead utility lines. Currently, there is limited utility information available, and further analysis will be necessary as the project advances into the next phase of design.

2.1 Option A - City Hall to Convention Center via Triangle Development and K Street (3.8 New Track Miles)

Beginning at the City Hall stop on Merkley Avenue in West Sacramento with a single exclusive tail track (for off-line vehicle storage), the alignment would proceed northward through a turnout, introducing double track, and then turn right onto West Capitol Avenue. The embedded, two-way, single track alignment on Merkley would be adjacent to a side platform at the existing curb line. The intersection is currently controlled by one stop sign on Merkley and would require full signalization for streetcar operations. Traffic analysis will be detailed in a separate memorandum.

The alignment would proceed eastward in the left lane of West Capitol Avenue, adjacent to the median, past a center platform (West Capitol stop) which would occupy the existing median immediately west of what is now the access road onto, and over Capitol City Freeway, (also known as State Route 275). The double-track alignment would then turn

right, southward, into the two existing travel lanes of the access road, which is planned to become Garden Street in the future according to the Triangle Street Network plan. The intersection at West Capitol Avenue and planned Garden Street is currently unsignalized and would require full signalization for streetcar operations.

Table 1
Conceptual Alignment Summary
Option “A” (Refer to Figures 1A-1C)

Street	Segment	Tracks in:	Remarks
Merkley Avenue	Terminus to West Capitol Avenue	North curb lane	Two-way single track at City Hall Stop/Terminus
West Capitol Avenue	Merkley Avenue to Garden Street	Left (inside) lane	Streetcar runs in traffic adjacent to existing median
Planned Garden Street	W. Capitol Avenue to Capitol City Freeway	Travel lane	Future at-grade intersection, no stops
Planned Garden Street	Capitol City Freeway to Riske Lane	On new trestle	Two-way single track on temporary trestle over switch yard
Riske Lane	Garden Street to South River Road	West edge of ROW	Two-way single track, temporary alignment
South River Road	Riske Lane to Capitol City Freeway	Travel lane	Two lane, two-way traffic, adjacent to parking
Capitol City Freeway	South River Road to Tower Bridge	Left lane	Transitioning to exclusive single track
Tower Bridge	Capitol City Freeway to Capitol Mall	Median	Two way, exclusive, single track
Capitol Mall	Tower Bridge to I-5 Crossing	Median	Exclusive, embedded double track
Capitol Mall	I-5 Overcrossing	Median	Exclusive double track on top of deck
Capitol Mall	I-5 to Third Street	Median	Exclusive, embedded double track
Capitol Mall	Third Street to Eighth Street	Median	Exclusive, landscaped track
7 th , 8 th , K Streets	Capitol Mall to Twelfth Street	Existing LRT track	Shared with light rail vehicles
12 th /K Pedestrian Mall	Eastern terminus	Exclusive ped area	Two-way single track

The proposed alignment would continue south along Garden Street through a planned at-grade intersection with Capitol City Freeway. This track alignment option assumes that the intersection will be at-grade and signalized (by others) before installation of streetcar tracks. Also assumed is that the Triangle Street Network will not be in place before track construction, and thus most of the track which traverses the future network will be built in existing street right of way and right of way acquired for this project. Most of this track and other improvements will have to be removed and rebuilt upon development of the Triangle Street Network.

After crossing Capitol City Freeway the double track alignment would immediately proceed between temporary side platforms for the Triangle stop (the future stop will be at the intersection with planned Park Avenue) and then through a turnout, entering into a single-track operation. The alignment would traverse over the existing Union Pacific rail yard on a temporary trestle. The approximately 1200 foot long by twenty foot wide trestle would climb up and over the rail yard and come down heading south along the western edge of the existing Riske Lane right of way. Additional right of way would likely be needed for this temporary trestle alignment.

Continuing in a single-track configuration along the edge of Riske Lane, the alignment would turn left at the intersection of South River Road and then revert to double track operation serving the Riske Lane stop. The existing intersection would require modification of the existing traffic signal, or possibly a train-activated signal controlling the southbound approach.

The tracks would then run east in the two existing driving lanes of South River Road with continuous on-street parking on both sides. The Riske Lane, South River Road and Raley Field stop platforms would be formed by bumping out the curb lines to meet the trackway, displacing a number of parking spaces. Just prior to the Raley Field stop, the tracks would go through the southerly legs of an existing four-way-stop controlled intersection at Ballpark Lane and Third Street. Due to “game day” traffic this intersection and streetcar operations could benefit from full signalization but the existing configuration may suffice. There are two existing rail crossings along South River Road (Sta 29+00 and 48+00) which are assumed would be abandoned prior to the streetcar project.

From the Raley Field stop the alignment would turn right (eastbound) onto Capital City Freeway and the approach to Tower Bridge. The Tower Bridge approach will require a train activated signal to control eastbound traffic on Capitol City Freeway. It is assumed that the streetcar would cross Tower Bridge in an exclusive, single-track configuration along the centerline of the structure where streetcars have run in the past. It is further assumed that two travel lanes in each direction would be maintained, with bicycle traffic diverted onto new ten foot wide sidewalk (see the Bridge Structure Evaluation Technical Memo, Alternative 1 for more information).

On the east side of Tower Bridge, the alignment would cross an active Sacramento-Northern Railroad track and cross the Front Street intersection, still in an exclusive median, before reverting to a double-track alignment serving a center platform at the Old Town stop. The heavy rail crossing and currently unsignalized Front Street intersection would require new

interconnected railway signalization. The Old Town stop would also be situated within an exclusive trackway median providing a place for westbound streetcars to dwell while waiting for eastbound streetcars to cross the bridge and clear the single track section.

The exclusive, median-running trackway would allow for the rails to be anchored on top of the existing I-5 overcrossing, just east of Old Town stop, which would avoid costs for retrofitting the tracks into the existing roadway deck.

Continuing eastbound across the I-5 overpass it is assumed that the two existing access ramps from Third Street onto the overpass would be abandoned enabling a new roadway cross section approaching Third Street consisting of sidewalks and bike lanes in both directions, a two-way exclusive trackway, two travel lanes in each direction and an eastbound U-turn lane.

The trackway would then cross Third Street at grade and enter the grass median, and exclusive running operation, for the balance of the track alignment on Capitol Mall. It has been proposed for the trackway to have a landscaped surface treatment and not be a typical concrete slab. Some advantages to this are less disruption to existing traffic during construction, improved streetcar operations, (no waiting in traffic queues), fewer catenary poles, and preservation of existing roadway pavement. Existing signals at cross streets could probably be modified to handle the streetcar operations; streetcars would wait during left turn phases and proceed during through phases, assuming left turning traffic proceeds only with a green arrow. The biggest unknown on Capitol Mall is the location of existing utilities. If potential costs associated with a conflicting major utility would preclude a median alignment, it is feasible that the streetcars could run in the left or right traffic lanes to avoid major utility relocations. An analysis of the proposed location of the track alignment within the right-of-way will be conducted in the next phase of design.

Capitol Mall stops would include Old Town (center platform), Fourth Street (center platform), and Eighth Street (side platform, eastbound only). The eastbound streetcar operations would then leave Capitol Mall and join the existing Sacramento Regional Transit (RT) LRT tracks on Eighth Street. The proposed westbound stop in this vicinity would be shared at the existing LRT platform on Seventh Street. Westbound streetcars would turn from the shared-running operations on 7th Street onto Capitol Mall.

The streetcar operations would operate jointly on existing RT LRT tracks on 7th/8th Streets and along K Street to 12th Street. While on the shared track portion of the alignment, streetcars could share existing light rail platforms for cost savings, ease of stop recognition and passenger transfers. The currently preferred streetcar vehicle, a historic replica, is assumed to be equipped with lifts for disabled passengers capable of meeting any boarding

level between vehicle floor and top of rail, so would be compatible with all existing light rail platforms. Shared platforms would include 7th and Capitol (Seventh Street), Saint Rose of Lima Park (7th and 8th at K Street), and Cathedral Square (11th Street).

On K Street approaching 12th Street a new cross-over would enable streetcars to enter a short stretch of shared single track, then crossing 12th Street for access to the terminus stop. The track would extend far enough beyond the platforms for offline vehicle storage.

2.2 Option B - City Hall to Amtrak Station via Capitol Freeway and 5th Street (3.2 New Track Miles)

Table 2 summarizes the current alignment proposal for Option B.

Table 2
Conceptual Alignment Summary
Option “B” (Refer to Figure B)

Street	Segment	Tracks in:	Remarks
Merkley Avenue	Terminus to W. Capitol Ave.	North curb lane	Two-way single track at City Hall Stop/Terminus
West Capitol Avenue	Merkley to Garden	Left (inside) lane	Shared lane adjacent to existing median
Planned Garden Street	West Capitol Ave. to Capitol City Freeway	Travel lane	Future at-grade intersection, no stops
Capitol City Freeway	Garden Street to Tower Bridge	Median	Exclusive double track
Tower Bridge	Capitol City Fwy. To Capitol Mall	Median	Two-way, exclusive, single track
Capitol Mall	Tower Bridge to I-5 Crossing	Median	Exclusive, embedded double track
Capitol Mall	I-5 Overcrossing	Median	Exclusive, above deck, double track
Capitol Mall	I-5 to Third Street	Median	Exclusive, embedded double track
Capitol Mall	Third Street to Fifth Street	Median	Exclusive, landscaped, double track
Fifth Street	Capitol Mall to I Street	Right lane	Two way, double track, adjacent to parking
Fifth Street	I Street to H Street	Right lane	Single, exclusive, embedded, adjacent to curb
H Street Terminus	Adjacent to Amtrak Platform	Right lane	Single, shared with existing LRT

The eastbound alignment would begin at the City Hall stop on Merkley Avenue in West Sacramento, and then turn right onto West Capitol Avenue, passing the West Capitol Avenue stop and turning right on planned Garden Street. The trackway would then turn left onto Capitol City Freeway through a new at-grade intersection.

Running east, the tracks would be located in the median (exclusive running) or in the left-lane adjacent to the median. The alignment would pass under the existing Union Pacific Railroad over-crossing and then arrive at the Gateway stop adjacent to a new, signalized, at-grade intersection with Fifth Street. The type of trackway used in the Capitol City Freeway median could be one of several types depending on cost constraints and aesthetics, and could include embedded concrete track slab, landscaped or grass track, or tie and ballast. Continuing in the median the alignment would cross a new at-grade intersection at Third Street. The alignment would enter a single-track segment across the Tower Bridge, and then back to a double-track alignment. Similar to Option A the exclusive-running tracks would serve the proposed Old Town stop, and then cross I-5 and Third Street into the Capitol Mall median where landscaped double track would extend as far as Fifth Street.

The alignment would turn north at Fifth Street running on embedded track in the right lane adjacent to on-street parking. Fifth Street's lane configuration and traffic signaling would be converted for two-way traffic operation for at least the length of the streetcar alignment. Twin, far-side stops would be located at both L and J Streets on sidewalk bulb-outs, and the tracks would follow the existing roadway as it passes under the Westfield Plaza shopping center. A turnout in the I Street intersection would consolidate eastbound and westbound streetcars in an exclusive single-track alignment along the west curblineline of 5th Street, adjacent to the Amtrak station. Immediately north of the Amtrak station the single-track alignment would turn left and join with existing LRT tracks to serve a shared terminus stop platform. The tracks would connect to the existing LRT tracks with a cross-over connection at 5th Street or to the west of the Amtrak (LRT) platform.

3.0 Cost Saving Methods

Alignment design offers opportunities to minimize costs, and in the case of the alignments described above there are significant cost savings to be realized. Alignment options A and B share several of these cost saving elements including:

- Segments of left lane and exclusive median running alignment; which typically minimize roadway regrading, consolidate platforms, and reduce the required number of overhead catenary system (OCS) poles because they are shared between the alignments.
- Sharing of existing LRT vehicle maintenance facilities; enabled by the joint use of LRT tracks.
- Historic single track alignment in the center of Tower Bridge; which saves on rail and OCS costs and significantly minimizes required structural modifications to the bridge.
- Exclusive trackway on the I-5 overpass; which again reduces construction costs and required structural modifications.

Alignment option A has two significant cost saving elements not shared with option B:

- Segments shared with existing LRT trackway; which obviously provides great savings in infrastructure costs and construction impacts. Not only are the tracks already in place, but also OCS, electrical substations and platforms.
- Single track alignment on the temporary “triangle trestle”; which minimizes the size of the structure, thereby reducing construction and right of way costs.

4.0 Stop Locations

The stop locations were selected as being most consistent with project objectives. Platform dimensions will depend mainly on the streetcar vehicle ultimately selected. The currently preferred vehicle is a vintage replica, 45 to 50 feet long, 8.5 feet wide, high floor, double ended, double sided, and equipped with onboard lifts for mobility-impaired riders. The lifts are capable of loading from any level between vehicle floor and top of rail, therefore will be compatible with existing curbs, LRT platforms and other potential boarding areas. This will enable maximum flexibility in platform design to be developed later in the design process. For purposes of this memo the platform is assumed to be fifty feet long and six inches high measured from gutter flow line.

For this project three general treatments or amenity levels are envisioned depending on the location and anticipated usage of each platform. In the following table they are separated into three levels: **Low**, for existing LRT platforms which already have the basics, and only a few additional signs will be needed; **Medium**, for new platforms offering the basics for passenger comfort and information, including a shelter (preferably “off the shelf”), a bench, a leaning rail, signage, trash can, and “next train” information screen; **High**, for new platforms on signature streets, in architecturally significant areas and at stops anticipated to serve larger groups of riders, e.g. Raley Field. These amenities would include the basics and could additionally include architecturally unique shelters and furnishings, larger/multiple shelters and furnishings, and landscaping.

The following tables provide information on conceptual platform configurations:

Table 3
Stop Location Summary, Option “A”

Proposed Stop	Platform Type	Amenities	Remarks
City Hall	Side, single	High	West terminus, new transit center
West Capitol	Center	Medium	In existing median
Triangle (temporary)	Side, double	Medium	At west end of temporary trestle
Riske Lane (temp)	Side, double	Medium	
Raley Field (temp)	Side, double	High	Special events, potential single track dwell
Old Town	Center	High	Exclusive trackway
Fourth Street	Center	High	In grassed mall median
Capitol/7 th (WB, shared)	Side	Low	Existing, westbound only, LRT
Capitol/8 th (EB)	Side	High	Eastbound only
7 th /K Streets (WB, shared)	Side, single	Low	Existing LRT
8 th /K Streets (EB, shared)	Side, single	Low	Existing LRT
11 th /K Streets (shared)	Side, double	Low	Existing LRT
12 th /K Terminus	Side, double	High	In pedestrian mall/sculpture court

Table 4
Stop Location Summary, Option “B”

Proposed Stop	Platform Type	Amenities	Remarks
City Hall	Side, single	High	West terminus, new transit center
West Capitol	Center	Medium	In existing median
Gateway	Center	Medium	In existing median
Raley Field	Center	High	Special events, potential single track dwell
Old Town	Center	High	Exclusive trackway
Fourth Street	Center	High	In grassed mall median
L Street	Side, double	Medium	
J Street	Side, double	Medium	
Amtrak Station	Side, single	Low	Existing LRT

Streetcar infrastructure built in the Triangle development area would probably have to be removed or relocated as the new street grid is constructed. Also notable are the Option A stop locations on Capitol Mall at Seventh and Eighth Streets. It is assumed that the existing LRT platform on seventh (north of Capitol Mall) can be shared with streetcar. However the existing LRT companion platform on Eighth is on the south side of Capitol Mall and is not on the streetcar alignment. This report places the streetcar platform at Eighth in the median of Capitol Mall, so it serves the proposed streetcar line but not the LRT line. In subsequent

design phases the possibility should be explored to build a new shared platform on Eighth Street on the north side of Capitol Mall.

5.0 Intersection Configuration and Operation

Following is a discussion of roadway intersections which will be affected by streetcar operations.

5.1 West Capitol Avenue at Merkley Avenue

This three-way intersection at City Hall terminus (and future transit center) is currently controlled by one stop sign on Merkley Avenue, and will require full signalization for streetcar operations. Westbound Streetcars will turn left onto Merkley Avenue with the general left turn arrow, and eastbound streetcars will turn right onto West Capitol during a dedicated streetcar-only signal phase.

5.2 West Capitol Avenue at (future) Garden Street

This existing “tee” intersection is planned for reconfiguration by a previous project so that the through movement becomes a curve to the south onto Garden Street, and West Capitol Avenue to the east tees into the middle of the new curve. Streetcars will run through this intersection in the left travel lane with traffic. The intersection will be fully signalized and left turns will be controlled.

5.3 Future Garden Street at Capitol City Freeway (Route 275)

This existing grade separated intersection is anticipated to be rebuilt in a four-way at-grade configuration before the streetcar is introduced. In general, for Option A, the streetcar will run through the intersection with traffic. A transition out of the auto lanes may be necessary here in order to operate across the proposed (single-track) trestle. If the transition occurs at this intersection, separate streetcar-only phases will be needed in the traffic signal cycle.

5.4 Riske Lane and South River Road

Eastbound streetcars will approach this existing four-way stop-controlled intersection on the proposed single-track segment along the west edge of Riske Lane. Streetcars will need to transition into and out of the roadway here by modifying the existing traffic signal to include a streetcar-dedicated signal phase. Westbound streetcars, dwelling at the Riske Lane stop until the single track is clear, will activate the traffic signal allowing them to proceed through the intersection and onto the exclusive single-track.

5.5 South River Road at Ballpark Lane/3rd Street

Streetcars will run with traffic through this existing four-way stop-controlled intersection.

5.6 South River Road at Capitol City Fwy. (West Approach to Tower Bridge)

Eastbound streetcars will run in the traffic lane on the existing ramp to Capitol City Freeway at the west approach to Tower Bridge. They will then activate a crossing gate or traffic signal, stopping eastbound Capitol City Freeway as they proceed onto the exclusive, single-track segment across the Tower Bridge. Westbound streetcars coming off the bridge will activate the same signal or gate as they turn left onto South River Road. Other ramps merging into this shared lane need to be considered in the traffic signal control.

5.7 Capitol Mall at Front Street (East Approach to Tower Bridge)

This existing unsignalized intersection at the east approach to Tower Bridge includes Capitol Mall running through east-west, Front Street to the north (right in-right out and stop controlled), and, across from Front Street, a hotel driveway (right out only). All left turns are prohibited in the intersection. A Sacramento Southern Railroad track runs along the west side of Front Street crossing Capitol Mall and protected by gates. For traffic operations this intersection will remain unsignalized and operate as it does today. Streetcar and heavy rail signals will be fully interlocked. Hotel left turn access will remain east of the intersection with storage for a few cars in the east “shadow” of the Old Town platform. Since streetcars travel very slowly near the platform and visibility is good, the left turn pocket will probably need no extra traffic control measures to prevent collisions.

5.8 Capitol Mall at 3rd through 6th Streets

Streetcars will cross these intersections from exclusive-running in the median. At the intersections with controlled left turns (traffic may proceed only with green arrow) no signal modifications will be needed – streetcars will cross the intersections during the same signal phase as through-traffic. Turn signals and phasing will have to be added at intersections as necessary to provide for protected left-turn movements

5.9 Capitol Mall at 7th and 8th Streets

A streetcar-only phase will have to be added at these intersections where Streetcars enter and exit Capitol Mall median and join existing LRT operations on 7th and 8th Streets.

5.10 Existing LRT - Seventh, Eighth, and K Street Intersections

Streetcars will operate as light rail vehicles currently do on these sections of shared trackway. Traffic operations and signals should remain unchanged.

5.11 K Street at Twelfth Street

Eastbound streetcars will proceed straight across 12th Street using the existing LRT signal phase. Westbound streetcars entering the intersection on the shared single track will use the same signal phase, proceeding only when the trackway is clear of other vehicles. A new pedestrian signal may be needed where streetcar tracks cross the existing sidewalk on the east side of 12th Street.

5.12 Option B Intersections

Option B has several intersections in common with Option A starting with Merkley/West Capitol and West Capitol/Garden which are described above. At Garden/Capitol City Freeway the trackway will turn left into the freeway median. A streetcar-only signal phase for both eastbound and westbound tracks will likely be needed here. The alignment will then run in an exclusive median configuration on Capitol City Freeway, then through a new at-grade intersection at Fifth Street (with through auto traffic), then rejoin the Option A alignment at the west approach to Tower Bridge. Assuming this trackway will be constructed before the planned, at-grade reconfiguration of the Third Street intersection, only a pedestrian-activated crossing will be needed at South River Road/Raley field stop; streetcars will continue to operate in a continuous exclusive median onto, and beyond, Tower Bridge. At this point the alignment is the same as Option A, continuing on Capitol Mall to Fifth Street where a streetcar-only signal phase will be needed to enable streetcars to turn left out of the median. On Fifth Street the trackway will be embedded in the travel lanes. It is assumed that traffic operations on Fifth Street will be changed to a two-way configuration with parallel parking on both sides and one travel lane in each direction; streetcars will operate in traffic requiring no special signal modifications. A streetcar-only signal phase will be needed to enable streetcars to cross I Street and enter a one-block section of exclusive, two-way single track adjacent to the Amtrak Station.

6.0 Alignment Impacts, Mitigation, and Integration

6.1 On-Street Parking

Option A

Field observations and aerial photos indicate that in West Sacramento on-street parking would be displaced at the following stop locations: City Hall, Riske Lane, South River Road

and Raley Field. On-street parking in these areas appears to be un-metered and underutilized. The number of parking spaces displaced, perhaps four per platform and ten at City Hall stop, would total approximately 35. Additionally, on Riske Lane at the east approach to the temporary trestle the existing lanes would be reconfigured to allow single track exclusive running for approximately 800 linear feet. This will likely further impact existing available areas for on-street parking

In downtown Sacramento there appears to be no existing on-street parking along Capitol Mall, and the balance of the alignment shares existing LRT track; therefore no existing on-street parking would be displaced.

Conceptual alignment Option A would displace approximately 35 existing on-street parking spaces prior to redevelopment of the affected areas.

Option B

In West Sacramento on-street parking would be displaced only at the City Hall stop and would amount to approximately 10 spaces. The balance of the West Sacramento alignment would be median-running and would not impact existing parking.

It is assumed there is no existing on-street parking on Capitol Mall, and it also appears there is no existing parking on Fifth Street. If the reconfiguration of Fifth Street included introduction of on-street parking, the streetcar alignments would run adjacent to the new parking lanes; thus Option B would bring additional on-street parking to downtown Sacramento.

6.2 Light Rail Inter-operability

From the standpoint of track geometry and mechanical/electrical/track compatibility, streetcars can operate on existing LRT tracks without modifications to tracks or vehicles. Please see the Service Criteria Technical Memorandum for more information on shared operations.

If light rail vehicles should need to operate on some or all of the new streetcar trackway then that portion of trackway would have to be designed and built to meet more demanding LRT standards. And, as light rail vehicles are heavier than streetcars, existing structures could require modifications beyond those required for introduction of streetcar operations. Please see the Bridge Structure Evaluation Technical Memorandum for more information.

6.3 Pedestrians and Bicycles

Once the basic route and stop locations have been decided, alignment design has a number of effects on the pedestrian and bicycling environments. These mostly boil down to a comparison, independent of cost and other considerations, between right lane, left lane, and exclusive running alignments.

Right lane running alignments are sometimes considered more pedestrian-friendly because they are adjacent to the sidewalk, and one must only step from the sidewalk onto the streetcar. The down side is that if one is riding streetcar to and from a particular destination it is necessary to cross the street to complete one's trip. And sometimes the stop on the other side isn't directly across from its companion stop, but perhaps a block in one direction or the other.

For bicyclists, right lane-running tracks are simply to be avoided, by taking a parallel street. The rail flangeway, a bike-eating groove three feet from the curbline, cannot coexist with bike lanes, which usually run on the right side of the road. There are ways to design around this problem, but they typically aren't as graceful, or effective, as separating right lane rail alignments from parallel bike lanes.

Left lane-running rail alignments on two-way streets typically feature center platforms which serve stops in both directions. Pedestrians must cross half the street for every trip, but the stops are visible and intuitive. Because these platforms are in the middle of the road extra care must be taken in designing them for passenger safety and comfort. The wider a center platform is, the wider the buffer between pedestrians and auto traffic will be, therefore streets with existing wide medians are ideal for locating center stops. Exclusive median-running trackway provides an extra ten feet or so (the trackway width) of buffer between center platforms and auto traffic. And, finally, left lane tracks and bike lanes can successfully coexist.

The conceptual alignment options presented attempt to take advantage of existing medians and lane configurations to benefit all users while minimizing project costs.

One clear improvement introduced by both alignment options is the important connection between Sacramento and West Sacramento, the Tower Bridge crossing. New bike lanes will be introduced between Third Street in Sacramento and the bridge, and new ten foot wide sidewalks on Tower Bridge can be used to divert bikes from the roadway. It is likely that the intersection and roadway reconfiguration work planned for Capitol City Freeway will include bike facilities as well.

6.4 Construction Impacts

Like any construction project, streetcar work can impact adjacent property owners and users, and, streetcar operations can degrade vehicle access to adjacent properties.

Much of this construction disruption is due to the track slab installation. Advances in the track slab design has helped to expedite the construction process while maintaining access to adjacent properties for vehicles and pedestrians. Utility relocation work needed to protect or ensure access to underground utilities, can also be fairly disruptive however, the intent of the design process will be to minimize these relocation requirements. Installation of OCS and other poles are generally a localized operation and can usually be done without street closures.

Left lane and median alignments tend to impact adjacent properties less than right lane alignments because sidewalks, driveways and on-street parking can be left undisturbed and construction staging can be accomplished at least partially in the median. Also, the left lane often has a flatter existing cross slope providing an easier match up at the track slab edges.

Installation of rails and OCS systems on the Tower Bridge will impact general traffic by closing or reducing the number of travel lanes. Construction activities will also need to be coordinated with the navigational needs and requirements of the Sacramento River.

Option A could be expected to have the greatest construction and access impacts to adjacent properties, particularly in the Triangle area of West Sacramento. They could include:

- Temporary and possible permanent closure of one access road into the residential development currently under construction to the west of the temporary streetcar trestle
- Construction disruption to the UPRR rail yard adjacent to the temporary streetcar trestle
- Construction disruption and possible impacts to the access for the Sacramento Stucco business on Riske Lane
- Possible construction disruption and a change in left turn access to Embassy Suites Hotel at the east approach to Tower Bridge

Option B avoids the Triangle area, but any impacts at Embassy Suites Hotel would be the same as option A.

7.0 Conclusions

Both options are feasible in terms of alignment and track work. The biggest unknowns are associated with crossing the railroad yard, FRA requirements for crossing the active rail line at First Street, potential impacts to existing utilities, and phasing with other projects on Capitol City Freeway and the Triangle development.

Another consideration may be a hybrid option made up of Option B in West Sacramento and Option A in downtown Sacramento.